



TITLE: Nephrostomy and Biliary Tube Management: A Review of the Clinical Evidence and Guidelines

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CONTEXT AND POLICY ISSUES

Nephrostomy and biliary tubes are drainage catheters that are placed into the renal collecting system or biliary tree and assist in draining urine or bile, respectively. The most common indication for nephrostomy or biliary tubes is obstruction of the renal collecting system or biliary tree.¹⁻⁶ Obstruction can occur for several reasons such as calculi, stones, malignancy, strictures or abscess.^{1,5,7,8} Other indications for nephrostomy tubes include access to the genitourinary system or diversion.¹

A nephrostomy tube is a catheter which is placed into the collecting system of the kidney to provide temporary or permanent drainage.^{4,6,9} Two different kinds of drainage systems exist: pigtail catheters which are placed under interventional radiology and wide bore catheters which are generally inserted in the operating room.⁹ The recommended time frame for nephrostomy tube changes ranges from 1 to 6 months, based on patient characteristics, with pregnant and stone forming patients requiring more frequent changes.^{1,10} Biliary tubes are catheters placed into the common bile duct (CBD) in interventional radiology.^{5,11,12} These tubes allow bile to drain either externally through a percutaneous drain or internally into the small intestine.^{5,12,13} As internal drains do not require ongoing care, they are not the focus of this review and are not discussed further. External biliary catheters may be changed every 8 to 12 weeks and prophylactic antibiotics may be used before the procedure.⁵

Complications of nephrostomy tubes include urinary tract infection which may result in hematuria, or progress to pyelonephritis, renal abscess or sepsis, a local inflammatory reaction of the skin as well as catheter displacement, dislodgement or fracture.^{1,8,10,14,15} The risk of infection may be related to the nephrostomy tube material, with latex having the greatest propensity for biofilm production allowing bacteria to adhere to the catheter.¹ It is recommended that patients are screened for methicillin resistant *Staphylococcus aureus* and have a urine culture to ensure the absence of infection in the urinary tract prior to insertion.⁴ Complications of biliary tubes are similar and include blockage, infection, pain, leakage, accidental dislodgement and, if stents are present, fracture leading to intestinal obstruction or perforation.¹⁶⁻²⁰

Previously, placement of a nephrostomy tube was an inpatient procedure; however, increasingly patients are having nephrostomy tubes placed by minimally invasive techniques in interventional radiology.¹ As a result, more patients may be required to care for their nephrostomy tube in an outpatient setting. Proper care of nephrostomy and biliary tubes has been proposed as a method of preventing complications. The objective of this paper is to review the literature, including evidence-based guidelines, for management of nephrostomy and biliary tubes and the impact of these management strategies on prevention of complications.

RESEARCH QUESTIONS

1. What is the clinical evidence regarding the management of nephrostomy and biliary tubes?
2. What are the evidence-based guidelines regarding the management of nephrostomy and biliary tubes?

KEY FINDINGS

No clinical evidence or evidence-based guidelines regarding the management of nephrostomy and biliary tubes was identified.

METHODS

Literature Search Strategy

A limited literature search was conducted on key resources including PubMed, The Cochrane Library (2014, Issue 7), University of York Centre for Reviews and Dissemination (CRD) databases, Canadian and major international health technology agencies, as well as a focused Internet search. No filters were applied to limit the retrieval by study type. Where possible, retrieval was limited to the human population. The search was limited to English language documents published between Jan 1, 2009 and Aug 6, 2014.

Selection Criteria and Methods

One reviewer screened the titles and abstracts of the retrieved publications and evaluated the full-text publications for the final article selection, according to the selection criteria in table 1.

Table 1: Selection Criteria	
Population	Patients with nephrostomy or biliary tubes Subgroup of interest: Patients receiving home care (both palliative and non-palliative)
Intervention	Management of nephrostomies and biliary tubes (typically managed by nurses), including dressing changes, use and type of skin cleanser, securement, flushing for patency, frequency for tube changing or collection, troubleshooting, etc.
Comparator	Any
Outcomes	Q1: Clinical benefits, harms (e.g., infections) Q2: Evidence-based guidelines
Study Designs	HTA/ Systematic review/Meta-analysis Randomized controlled trials Non-randomized studies (for safety only) Evidence-based Guidelines

Exclusion Criteria

Studies were excluded if they did not meet the selection criteria, were duplicate publications, case reports or case series, interventions focusing on management of complications of

nephrostomy or biliary tubes, guidelines of unclear methodology, or were published prior to 2009.

SUMMARY OF EVIDENCE

Quantity of Research Available

A total of 582 articles were identified from the literature search, 27 articles from the grey literature search for a total of 609 articles, and 34 were selected for full-text screening. None of the full-text references screened met the inclusion criteria for either of the research questions.

Appendix 1 describes the PRISMA flowchart of the results of the literature review for this report.

Summary of Findings

Based on the results of our literature search, there is a paucity of clinical evidence and evidence based guidelines for the management of nephrostomy and biliary tubes in any patient care setting. However, several institutional clinical care guidelines and patient information sheets of unclear methodology, that made recommendations for the care of nephrostomy and biliary tubes were found and are summarized in Appendix 2.^{1,2,4-6,8-10,12,13,21-26} These materials are designed to instruct both patients and nurses on the management of nephrostomy and biliary tubes in the hospital as well as home care setting. The completeness of evidence used in the development of these documents is unclear as literature search strategies are absent in these guidelines.

Limitations

The main limitation of this review is the lack of clinical evidence and evidence based guidelines of clear methodology in the management of nephrostomy or biliary tubes in any patient care setting. An attempt was made at summarizing lower levels of evidence, including clinical guidelines and patient information sheets of unclear methodology. As a result of lack of evidence on outcomes, it is uncertain to what degree following these management techniques will reduce complications of nephrostomy or biliary tubes.

CONCLUSIONS AND IMPLICATIONS FOR DECISION OR POLICY MAKING

The results of this literature search did not reveal any clinical evidence or evidence based guidelines which demonstrate that a particular technique for caring for a nephrostomy or biliary tube will reduce the risk of complications. Based on the lack of evidence, the degree to which the management techniques recommended by published clinical care pathways or patient information sheets (discussed in Appendix 2) will prevent complications of nephrostomy or biliary tube drainage tubes is unknown. Many of the recommendations made in these publications are based on best practices in wound and catheter care and the pathophysiology of the urinary and biliary system. While differences in recommendations exist, common themes of caring for a nephrostomy or biliary tube to prevent infectious complications include maintaining adequate fluid intake, use of hand hygiene or aseptic technique when changing dressings or bags, and proper skin care. Troubleshooting options for suspected blockage include inspecting the catheter for kinks, uncapping, flushing the tubing, or in the case of nephrostomy tubes encouraging oral fluid intake. More clinical evidence is required to evaluate the impact of these interventions on reducing the complications of nephrostomy or biliary tubes.

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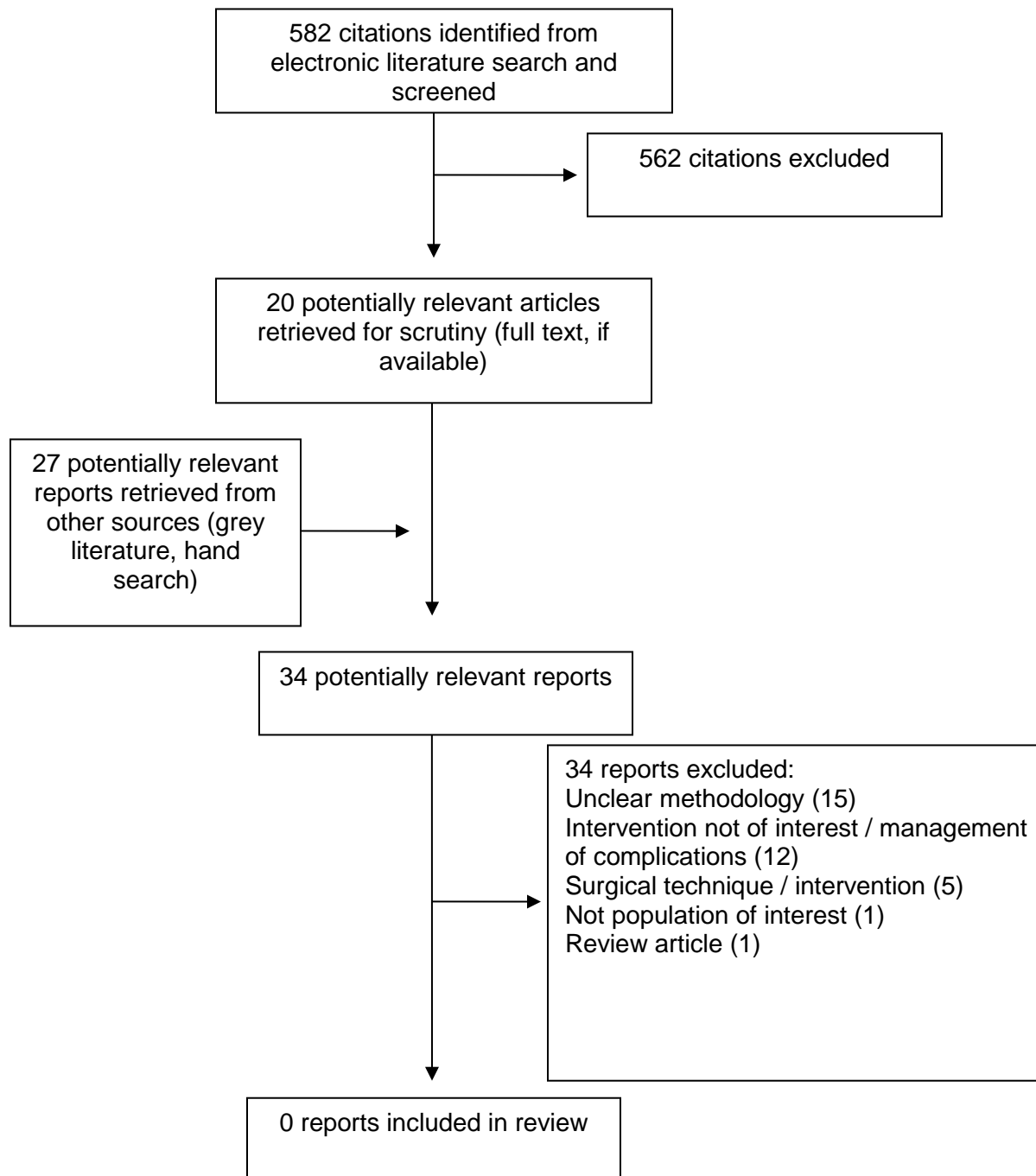
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APPENDIX 1: Selection of Included Studies



APPENDIX 2: Summary of Clinical Care Pathways & Patient Information Sheets

The literature search identified a number of clinical care pathways and patient information sheets. These documents provide recommendations for the management of nephrostomy and biliary tubes, however the degree to which they are evidence-based and the methods for development of these resources is unclear.

Management of Nephrostomy Tubes

General recommendations for patients and health care providers caring for nephrostomy tubes include routinely checking nephrostomy tube patency and monitoring for pain, leakage or bleeding, as well as fever.^{9,10,21} While showering is permitted, it is recommended that the nephrostomy tube site be kept dry for 48 hours and the site be covered until healing has occurred.²¹ Bathing as well as the use of hot tubs or swimming pools is not recommended with a nephrostomy tube.²¹ Unless contraindicated, patients are encouraged to drink 1.5 to 2.5 liters of fluid daily to ensure tube patency and prevent infection.^{4,6,8,10,21,23} Patient instruction to inspect their nephrostomy tube daily, looking for skin breakdown, soiled dressings, kinks in the tubing, and evidence of blockage such as decreased urine output, leakage around the insertion site or fever and chills was recommended.^{8-10,22}

Siddiq and colleagues recommended periodic reassessment of the nephrostomy tube indication and removal of unnecessary tubes as a method of preventing associated infection.¹ Prompt initiation of antibiotics in patients with signs of infection was also recommended if infection is suspected.¹ It was suggested that in the absence of clinical signs and symptoms of infection such as fever, flank pain, or chills that asymptomatic bacteruria from the nephrostomy tube not be treated with antibiotics.¹ If a patient develops fever, chills, back pain, foul-smelling urine or hematuria, it was recommended that a urine sample be collected from the tube using gravity under sterile technique and sent for culture and sensitivity.^{4,9,10} In the presence of such symptoms, Siddiq et al. suggested that clinicians follow the Infectious Disease Society of America's (IDSA) guidelines for treating urinary tract infections when more than 10^3 CFU/ml of a single bacterial species is grown from a sample taken from the nephrostomy tube.¹ Securing the catheter to the patients body and anchoring the collection bag may prevent infection as well as tube displacement and local skin irritation.^{1,8-10,22} Patients were also recommended keep their nephrostomy bag closed to reduce the risk of infection.²¹ If an infection occurs, it was recommended that consideration be given to nephrostomy tube replacement or removal.¹ The IDSA does not provide any specific guidance on removal or replacement in the context of infection.

An absence of urine, presence of blood in the collection bag, or flank pain may indicate that the tube is blocked.²⁴ If blockage is suspected it was recommended that nephrostomy tubes be irrigated or flushed using gentle force with normal saline or sterile water using sterile or aseptic technique.^{4,6,9,10,24} Two documents stated that hand washing before and after flushing the nephrostomy tube is essential and sterile gloves should be worn.^{6,24} Four guidelines recommend that the tip of the tube be cleaned with chlorhexidine or alcohol wipe prior to flushing.^{4,6,23,24} The recommended volume of fluid which should be flushed into the tube varied widely in the literature. A maximum of 10 to 20mL (range 2 to 20mL) was recommended for flushing into the nephrostomy tube, with patient monitoring for urine flow and signs of infection.^{6,9,10,23,24} If a blockage is suspected, gently pulling back on the syringe may dislodge an obstruction, however, if too much force is used this may cause trauma and bleeding.^{4,24} Some guidelines recommend against this practice without supervision of a medical professional.^{6,24} Some literature

recommended against routinely flushing a nephrostomy tube, as it may be associated with damage to the renal collecting system, however, if the nephrostomy tube is prone to blockage, then prophylactic flushing twice weekly may be attempted.^{1,12}

Guidelines recommend that urine should be drained from the bag routinely (4 to 5 times per day or when the bag is approximately half to two-thirds full), as the bag can become heavy and result in dislodging of the tube.^{6,8,12,21-23} Recommendation for the frequency of changing drainage bags ranged from three times weekly to every 7 days.^{4,8,10,12,22,23} The recommended frequency of dressing changes also varied from every other day to twice weekly; however, there was generally agreement across references that the dressing should be changed if it becomes visibly soiled.^{8,21-23} Recommended nephrostomy tube dressings include drainfix, which is a specialized catheter anchor, comfeel wafer, Op site, dry dressing, Uresil adhesive dressing, 3MTM No Sting Barrier Film and waterproof dressing prior to showering.^{10,22} Recommendations for the conditions under which a bag or dressing is changed also varied from simple hand hygiene to aseptic technique.^{4,10,12,22,23} At a minimum, hand washing was recommended before and after dressing changes.²¹ Some guidelines recommended that non-sterile gloves be worn during the procedure and that gloves be changed between the removal of the old dressing and application of the new one.^{21,23} When the old dressing is removed inspection of the site for erythema, discharge or leakage was recommended.²¹ There are various recommendations for the method of cleaning the nephrostomy tube site during dressing or bag changes. Some guidelines recommended antibacterial soap and water²¹ while others recommended sterile saline or water and drying with sterile gauze after removal of any debris.^{4,12} One guideline recommended that end of the nephrostomy tube be cleaned with alcohol or chlorhexidine when changing the dressing or drainage bag.²³

Trouble shooting for common problems associated with a nephrostomy tube are outlined in Table 2.

Table 2. Troubleshooting for Nephrostomy Tubes^{4,6,12,23}

Problem	Potential Cause	Potential Solution
Skin Pain / irritation	Caustic effect of urine	Increase frequency of bag changes Use skin protective wipes or seal around tubing Apply Orahesive powder to wet skin
	Allergic reaction	Apply skin protective wipe
	Infection	Increase frequency of dressing changes Apply topical antibiotic cream or ointment
Leakage of urine	Defective collection bag	Check for leakage and change collection bag
	Poor adhesion of flange	Remove excessive hair
Lack of Drainage	Kinked, dislodged, capped or blocked tube	Check tubing for kinks, remove cap, flush tube, reposition the patient, have the patient drink fluid
Pain	Dislodged or blocked tube	Check tube for signs of blockage
	Urinary tract infection	Send urine sample for culture and sensitivity Treat infection based on IDSA guidelines
Granulation tissue at tube site	Normal physiologic reaction	No action required

Removal of nephrostomy tubes depends on the type (pigtail vs. wide-bore) and aseptic technique is recommended.^{25,26} If a ureteric stent is in situ along with the nephrostomy tube, the drain is recommended to be removed in radiology under direct visualization to prevent the stent

from becoming dislodged.^{25,26} For drains removed outside of the radiology department, hand hygiene is recommended prior to drain removal and sterile gloves should be worn.²⁶ Guidelines state that a pigtail catheter must have the internal coil released by cutting the string inside the drain.^{25,26} Once the coil is released the tubing can gently be removed.²⁵ Wide-bore drains include Foley and Malecot catheters. Prior to removal of a Foley catheter, the internal balloon must be deflated using a syringe and then the tubing can gently be removed.^{25,26} A Malecot drain can simply be gently withdrawn.²⁵ It was advised that minimal resistance should be felt when removing the tubing; if resistance is felt, the tube may be encrusted and the advice of a more experienced clinician should be sought.²⁵

Biliary Tubes

Guidance in the management of biliary drains is more sparse than for managing nephrostomy tubes. General recommendations for caring for percutaneous biliary drains include emptying the catheter bag before it is completely full, avoiding baths, swimming or hot tubs, covering the tube during showering, and daily inspections for skin changes, kinks in tubing, drainage volume and appearance.^{5,12} Guidelines recommend that dressings should be changed every three days or more often if the dressing becomes soiled.^{5,12} Hand hygiene before and after dressing changes was recommended.¹² After removal of the dressing, inspection of the skin for any redness, irritation, tenderness or discharge and cleansing with soap and water was recommended.^{5,12} One organization recommended a combination of Tefla, Tegaderm, and gauze as an appropriate dressing while another recommended a Uresil dressing system, including Tefla.^{5,12} It is recommended that the drainage bag also be changed once per week.⁵

One resource recommended flushing the biliary tube twice daily with normal saline.⁵ It was recommended that flushing be undertaken with 10mL of normal saline after hand washing and cleansing of the port with an alcohol swab.⁵ Signs of a blocked biliary drain include decreased or absent bile, bile leakage, inability to flush, leakage when flushing, fever, chills, nausea, jaundice.⁵ If these symptoms occur, it was recommended that the catheter should be inspected for position, the stop-cock position should be confirmed, and kinks in the tubing identified and released.⁵ If a blockage is suspected, an attempt at clearing the blockage by flushing the biliary tube may be attempted.⁵ No guidance specifically addressing the prevention or detection of infected an infected biliary drain was identified.